

Posthysterectomy ureteric injuries: Presentation and outcome of management

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Abstract

Purpose: The purpose of the study was to evaluate the presentation and management of posthysterectomy ureteral injuries.

Patients and Methods: Fourteen patients with ureteric injuries after hysterectomy for benign diseases were evaluated. The diagnosis was done based on clinical presentation, intravenous urogram, computed tomography, cystoscopy, and retrograde pyelogram (RGP) depending on the clinical situation.

Results: Sixteen iatrogenic ureteric injuries in 14 patients over a 2-year period were evaluated. Hysterectomy was the cause of injury in all the cases, 12 abdominal and 2 were vaginal. Two patients presented with anuria, one had ureteric, and bladder injury with hemoperitoneum underwent emergency laparotomy and bilateral ureteral reimplantation. Another patient underwent RGP followed by stenting on the right side, left side unable to put stent so percutaneous nephrostomy (PCN) was done followed by antegrade stenting later. Two patients presented with septicemia and pyonephrosis were managed initially with PCN followed by balloon dilatation and JJ stenting. RGP and retrograde stenting was done in seven of the remaining ten patients and ureteric reimplantation in three patients.

Conclusion: Patient with ureteric injury should be evaluated and intervened at the earliest. Patients presenting early, within 2 weeks after hysterectomy have higher chances of success with endourological procedures, obviating the need for open surgery.

Key Words: “JJ” stent, stenting, ureterovaginal fistula

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INTRODUCTION

Injury to the ureter is a risk of any pelvic or abdominal surgery, including laparoscopy and ureteroscopy. The ureter is especially susceptible to injury during vascular, gynecologic, urologic, and colonic operations. Gynecological surgery remains the most common cause of ureteral injuries; total abdominal

hysterectomy is the operation most commonly responsible for a ureteral injury.^[1] Other rare causes are secondary to cervicocystopexies both pubic or vaginal, ovarian surgeries, and uterine aspiration.^[2] The overall incidence of ureteral injury varies between 0.5% and 10%. Damage to the ureter

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after external violence is quite rare, occurring in <4% of all penetrating and < 1% of all cases of blunt trauma. Analysis of 13 published studies concluded that the following procedures contribute to iatrogenic ureteral injuries: hysterectomy (54%), colorectal surgery (14%), pelvic procedures such as ovarian tumor removal (8%), transabdominal urethropexy (8%), and abdominal vascular surgery (6%). The total incidence of ureteral injury after gynecologic surgery is reported to be 0.5% to 1.5%, and after abdominoperineal colon resection, it ranges from 0.3% to 5.7%. Currently, the reported rate of ureteral injury varies between 0.5% (experienced surgeons) and 14% (inexperienced surgeons) after laparoscopic hysterectomy presently, laparoscopic assisted vaginal hysterectomy is the most common cause of iatrogenic ureteric injury worldwide, however, in developing, countries open gynecological surgeries still remain the most common cause. Risk factors for the development of ureterovaginal fistulae include endometriosis, obesity, pelvic inflammatory disease, as well as radiation therapy and pelvic malignancy. Nevertheless, Symmonds has noted that the patient with a ureteral injury following gynecologic surgery is typically one who had an uncomplicated, technically easy hysterectomy for the minimal disease. Thus, except for those oncologic cases where a segment of ureter is deliberately excised, many ureteral injuries are likely due to technical or iatrogenic factors.^[3] The morbidity associated with such injury may be serious, resulting in increased hospital stay, compromise of the original surgical outcome, secondary invasive interventions, reoperation, potential loss of renal function, and deterioration of the patient's quality of life. To decrease the incidence of iatrogenic ureteral injury, a sound knowledge of abdominal and pelvic anatomy is essential. Loss of continuity of the ureter may result from division or laceration, or from ischemic necrosis related to clamping, ligation, or damage to the blood supply of the ureter.^[4] Traditionally, most ureterovaginal fistulas have been repaired by ureteroneocystostomy.^[5] Endourological techniques are highly successful in treating posthysterectomy ureteral injuries.^[6]

PATIENTS AND METHODS

This study involved patients referred and managed in the department of urology for posthysterectomy ureteric injuries for benign conditions during 2 years from March 2011 to February 2013. During this period, a total of 14 patients with 16 ureteric injuries were treated. The mean age was 38.5 years (24–60-year-old).

All 14 patients suspected to have genitourinary injuries underwent, pretreatment evaluations including history and physical examination. Information was sought on, primary surgery done, intraoperative difficulties and postoperative complications. The various investigations done included: ultrasound of the urinary tract, serum creatinine, urine

culture and sensitivity, intravenous urogram (IVU)/computed tomography (CT) scan, cystoscopy and retrograde pyelography (RGP) [Figures 1-7].



Figure 1: Intravenous urogram of patient s/o right lower ureteric injury



Figure 2: Intravenous urogram of patient with left ureterovaginal fistula posthysterectomy showing leak



Figure 3: Retrograde pyelogram showing in initial difficulty in passing guidewire in patient with left ureterovaginal fistula



Figure 4: After manipulation of scope guide wire passed across the stricture



Figure 5: Left nephrostogram in patient in whom percutaneous nephrostomy was done for pyonephrosis s/o left ureterovesicular junction stricture

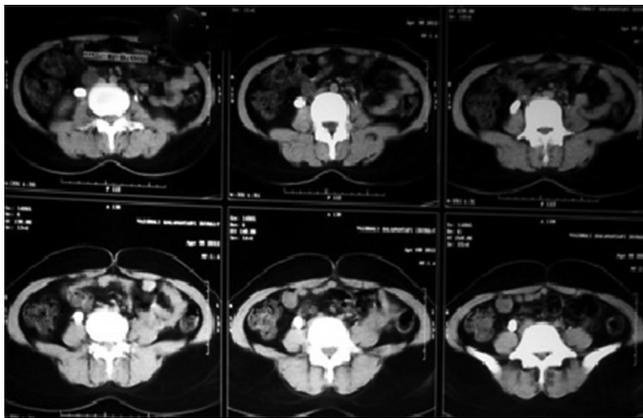


Figure 6: Computed tomography kidneys, ureters, bladder (P + C) of patient with right hydronephrotic and right ureterovaginal fistula



Figure 7: Computed tomography kidneys, ureters, bladder (P + C) of patient with right ureterovaginal fistula

RESULTS

There were 16 iatrogenic ureteric injuries in 14 patients over a 2-year period. Hysterectomy was the cause of injury in all the cases, among whom 12 were abdominal, and 2 were vaginal hysterectomies. The clinical presentation and the radiological findings of all the patients are tabularized in Table I. Two patients presented with anuria, among whom one had ureteric, and bladder injury with hemoperitoneum as detected by ultrasonography (USG) underwent emergency laparotomy and bilateral ureteral reimplantation with bladder repair. Another patient underwent RGP followed by stenting on the right side, on the left side, we were unable to put a stent, so percutaneous nephrostomy (PCN) was done followed by antegrade stenting later. Two patients presented with septicemia and pyonephrosis were managed initially with PCN followed by balloon dilatation and JJ stenting. Of ten patients who presented with urinary leak, seven patients were successfully stented. Another three patients, in whom stenting was

not possible initially and PCN was also not possible due to compact PCS as the ureter directly opened into the vagina, underwent ureteric reimplantation [Table 2]. No nephrectomies were performed. The overall successful resolution of ureteric injuries in JJ stent group in this series was 100%. Complications were wound infection in one patient, prolonged urinary leak in 1, both of which were managed conservatively and incisional hernia in one which required surgical correction. There was no mortality attributable to these ureteric injuries. Follow-up in all these patients was done at 1 month, 3 months, and 9 months after stent removal or definitive procedure. IVU was done in only those patients who showed hydronephrosis on USG [Figure 8]. In this study, two patients who underwent ureteric reimplantation showed hydronephrosis at 3 months follow-up, however, IVP showed no obstruction.

DISCUSSION

Injury to ureter is a known complication of pelvic or abdominal surgery, including laparoscopy and ureteroscopy.^[7] The incidence of iatrogenic ureteral injury during major gynecologic surgery is estimated to be about 0.5%–1.5%. The most common etiology for ureterovaginal fistulae is a surgical injury to the distal ureter, which is most commonly caused by gynecologic procedures. The vast majority of ureterovaginal

Table 1: Clinical and radiological findings

Clinical presentation	Radiological findings
Anuria with b/l flank pain following abdominal hysterectomy Urinary incontinence and leak per vagina History of abdominal hysterectomy 11 days back Left flank pain, vomiting, fever with chills, loss of appetite History of abdominal hysterectomy 2 weeks back	USG abdomen-b/l altered renal echogenicity with mild HUN IVU-contrast in the left distal ureter showing abrupt disruption with leakage of contrast collecting posterosuperiorly to the urinary bladder USG-moderate HD, focal edematous left VUJ. Collection along left paracolic gutter Left side PCN and nephrostogram-complete obstruction at the level of left lower ureter USG-moderate left HD with proximal HU IVU: Left side HUN up to bladder base USG-right kidney: Diffusely decreased cortical echogenicity with right HD with proximal HU with internal echoes in dilated PCS IVU-right HUN till lower end with obstruction at S1, S2 IVU-right HUN due to lower ureteric obstruction
Leak per vagina Vaginal hysterectomy 1 month back Difficulty in micturition, urinary leak, and burning micturition History of abdominal hysterectomy 2 weeks back	USG-right kidney showing HUN and right perinephric inflammatory mass or abscess Nephrostogram: Stricture at the lower ureter with mild HUN CT-right kidney mild HUN with ureterovaginal fistula
Urinary incontinence with history of abdominal hysterectomy 45 days back Complaints of the right flank pain and fever History of vaginal hysterectomy 10 days back	USG-left kidney showing mild HUN due to lower ureteric obstruction USG-right kidney showing mild HUN due to lower ureteric obstruction
Continuous urinary incontinence; history of abdominal hysterectomy 1 week back Complaints of the left flank pain History of abdominal hysterectomy 2 days back Complaints of the right flank pain History of abdominal hysterectomy 4 days back Complaints of the left flank pain, urinary incontinence History of abdominal hysterectomy 10 days back Anuria with b/l flank pain Vaginal hysterectomy 4 days back Complaints of the right flank pain History of abdominal hysterectomy 4 days back Complaints of the left flank pain History of abdominal hysterectomy 4 days back	USG-left kidney showing mild HUN due to lower ureteric obstruction USG-b/l HUN with increased cortical echogenicity USG-right kidney shows mild HUN due to lower ureteric obstruction USG-left kidney shows mild HUN due to lower ureteric obstruction

USG: Ultrasonography, HD: Hydronephrosis, HU: Hydroureter, HUN: Hydroureteronephrosis, HDUN: Hydroureter, b/l: Bilateral, IVU: Intravenous urogram, PCS: Pelviccalyceal system, PCN: Percutaneous nephrostomy, VUJ: Vesicoureteric junction, HDN: Hydronephrosis, HN: Hydronephrosis, CT: Computed tomography

Table 2: Surgical procedures undertaken

Surgical management	Number of affected ureters	Percentage
JJ stenting	11	68.75
Ureteric reimplantation	3	18.75
Laparotomy with bladder injury repair with bilateral ureteric reimplantation	2	12.5

**Figure 8:** Postoperative intravenous urogram of patient who underwent laparotomy and B/l ureteric reimplantation

fistulae occur during procedures for benign rather than malignant indications, hysterectomy being the most common cause.^[3] Iatrogenic ureteric injuries have increased markedly during the past two decades. Gynecological laparoscopic procedures account for more than half of the injuries, and the most common location is the lower ureter.^[8] The injury or fistula may become apparent either immediately or much more commonly, in a delayed fashion several days to weeks after surgery. Constitutional symptoms may result from hydronephrosis secondary to ureteral obstruction or urinary extravasation into the retroperitoneal space. The clinical history of ureterovaginal fistula is usually straightforward. Typically, a gynecologic procedure, such as hysterectomy, is involved. Poor intraoperative exposures, coupled with heavy bleeding at the operative site, are often the risk factors. The presence of normal upper tracts on imaging essentially rules out ureteral injury; however, the finding of partial ureteral obstruction associated with urinary leakage from the vagina strongly suggests the presence of an ureterovaginal fistula.^[9] Various investigations such as USG abdomen, three gauze test, IVU, Cystoscopy and RGP, CT urography, and magnetic resonance (MR) urography can

be used to confirm the clinical diagnosis. USG abdomen shows hydroureteronephrosis/pyonephrosis. Three gauze test differentiates vesicovaginal fistula (VVF), ureterovaginal fistula, and stress incontinence. In this test, 100 ml of 1:5 diluted methylene blue solution is instilled into the bladder through an urethral catheter after placing three dry sterile swabs in the upper, middle, and lower third of the vagina. The patient is then asked to walk around for 10 min, after which the swabs are removed and examined. If the lower swab is wet and stained blue, it indicates stress incontinence. If the upper swabs are wet and blue, that indicates VVF, and if the upper swabs are wet but not stained blue, it is an indication of ureterovaginal fistula. IVU demonstrates ureteric injury and hydroureteronephrosis, with cutoff of the contrast at the injured site of the ureter and contrast leak. CT and MR urography are used increasingly for detection of ureteric injuries and demonstrates hydroureteronephrosis due to ureteric stricture and ureterovaginal fistula. An RGP is helpful to diagnose ureteral injury, and the placement of ureteral stent could be attempted at the same time.^[10] In our series, open hysterectomy done for benign diseases was the cause of ureteric injury in all the patients. The presenting symptoms were leak per vagina, abdominal pain, fever, and anuria. JJ stenting was possible in patients who presented early (<2 weeks). Leak resolved completely in whom stenting was possible (100% success in all ten patients). In those patients where stenting was not possible underwent ureteric reimplantation because of failed antegrade stenting or failure to do PCN. If we look into the literature [Table 3] Selzman *et al.* reported that ureterovaginal fistulas resolved in all seven patients treated with an internal ureteral stent.^[6] Al-Awadi *et al.* reported a success rate of 59.4% with “JJ” stent insertion in their series of 75 patients with ureteral injuries.^[11] A combined ureteroscopic and fluoroscopic technique to re-establish ureteral integrity has been reported to be a successful treatment.^[15] Early intervention is recommended in the treatment of the iatrogenic ureterovaginal fistula, to minimize morbidity, discomfort, and cost.^[16] JJ stenting should be attempted in all patients presenting with ureteric injuries. If unsuccessful, these are the candidates for PCN or ureteric reimplantation depending on the clinical situation.

Table 3: Literature review

Study	Number of patients	Success rate with JJ stenting 1 (%)
Selzman <i>et al.</i> ^[6]	7	100
Al-Awadi <i>et al.</i> ^[11]	75	59.4
Turner <i>et al.</i> ^[12]	10	50
Koukouras <i>et al.</i> ^[13]	25	56
Ku <i>et al.</i> ^[14]	17	64.7
Our study	14	71.4

CONCLUSION

Posthysterectomy ureteric injury is not an uncommon complication of pelvic surgery. Simple hysterectomy for benign diseases is the most common cause of injury. The patient with ureteric injury should be evaluated and intervened at the earliest. Patients presenting early, within 2 weeks after hysterectomy have higher chances of success with endourological procedures, obviating the need for open surgery.

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Conflicts of interest

There are no conflicts of interest.

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